

A review of South Australian *Wurmbea* (Colchicaceae–Liliaceae): keys, new taxa and combinations, and notes

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Abstract

Wurmbea nilpinna R.J.Bates, a rare local endemic in the Davenport Range on Nilpinna Station in the Lake Eyre region of South Australia, and *W. dioica* ssp. *brevifolia* R.J.Bates, widespread in the wheat belt of south-eastern Australia, are described as new and illustrated. *W. citrina*, based on *W. dioica* ssp. *citrina* R.J.Bates, and *W. australism* based on *W. centralis* ssp. *australis* R.J.Bates, are raised to species level. A key is provided for all the South Australian species together with additional distribution records and other notes.

Introduction

Prior to 1980 only one species of *Wurmbea* was recognised for South Australia (e.g., Black 1943). This was *W. dioica* (R.Br.)F.Muell., known then as *Anguillaria dioica* R.Br.

Macfarlane (1980) reduced the Australian genus *Anguillaria* R. Br., the ‘early nancies’, to synonymy under *Wurmbea* and recognised four species from South Australia: *W. centralis* T.D.Macfarl., *W. dioica* ssp. *dioica*, *W. latifolia* T.D.Macfarl. and *W. uniflora* (R.Br.) T.D.Macfarl.

Bates (1995) increased the number of *Wurmbea* taxa in the state to twelve, nine species and three subspecies.

Curiously in 1995, just one week after publication of the aforementioned paper, the first South Australian *Wurmbea* examined by the author for identification proved to be a species not among those recognised there.

This present paper increases the number of recognised taxa of *Wurmbea* in South Australia to 15 (or 15 times the number recognised in 1975 and almost 4 times the number in Macfarlane’s 1980 revision!)

Some workers would recognise even more taxa (e.g., D.L. Jones, pers comm. 2001), but the author has remained conservative here. All taxa discussed have been studied throughout their range during field studies by the author over twenty years.

Key to the South Australian species of *Wurmbea*

- 1: Lower leaves basal paired or almost opposite, of similar shape and size 2
 Lower leaves well separated, usually of different shape and size 4
- 2: Lower leaves with serrated margins; flowers unisexual; nectaries one per tepal as a single band of colour
 *W. latifolia*
- Lower leaves with smooth margins; flowers hermaphrodite; nectaries 2 per tepal 3

- 3: Lower leaves narrow, linear, decumbent; flower single, less than 7 mm across; capsule elongate on a decumbent stem *W. decumbens*
 Lower leaves broadly linear-lanceolate, not decumbent; flowers usually several, greater than 7 mm across; capsule ovoid on an erect stem *W. australis*
- 4: Nectary one per tepal, either central or as a single band of colour 5
 Nectaries two per tepal 7
- 5: Nectary pitted, in centre of tepal, not forming a band; flowers hermaphrodite *W. nilpinna*
 Nectary not pitted, a continuous band of colour; flowers unisexual 6
- 6: Flowers bright yellow; tepals fleshy, obtuse; nectary yellow brown *W. citrina*
 Flowers white or pink; tepals not fleshy, acute; nectary usually purple *W. dioica*
- 7: Flower usually single, tepals less than 3mm broad 8
 Flowers usually several, tepals broader than 3mm 10
- 8: Flower greater than 10 mm across, tepals not clasping the filament, tepal margins violet or bright purple-pink, elongate, outer margin of nectary not winged, growing in semi arid areas *W. stellata*
 Flower less than 10 mm across; tepals clasping the filament (at least in living plants), without colourful edging, outer margin of nectary appearing winged, growing in mostly coastal areas 9
- 9: Basal leaf linear-lanceolate; nectary receptacle thickened; anthers yellow, spring flowered plants of high rainfall areas *W. uniflora*
 Basal leaf filiform; nectary receptacle not thickened; anthers purple, restricted to the west coast *W. sinora*
- 10: Tepals forming a cup shaped tube; nectaries small, elliptical with margins elevated all round; base of styles connate . . .
 *W. deserticola*
 Tepals not forming a tube; nectaries large, not elliptical, without elevated margins; base of styles not connate . . 11
- 11: Flowers crowded; nectaries semi-oval; desert plants from mountains of the North West *W. centralis*
 Flowers well spaced; nectaries like broad ledges; mountain plants of the Flinders Ranges and Northern Lofies
 *W. biglandulosa*

W. nilpinna* R.J.Bates**W. nilpinna* R.J.Bates, sp. nov.**

A Wurmbiae speciebus aliis statura maxima, nectario singulare marsupiforme in quoque tepalo, marginibus roseis tepalorum, ramis purpureis differt. Fig. 1.

Typus. South Australia, Lake Eyre region, Davenport Range, Nilpinna Station, 15.viii.1993, F.J. Badman 7107; (holo.: AD; iso.: AD).

Description

Perennial lily, sprouting only after heavy cool season rain from an ovoid corm to 3 cm diam, encased in shining, hard, hyaline sheaths. *Plants* to 20 cm tall, with fleshy purplish stems to 3mm diam. *Leaves* three, the lowest linear-lanceolate, falcate, to 15 cm long and 5 mm wide, with a leathery texture; middle leaf similar but shorter and with an inflated base, set 3-4 cm above the lowest leaf; upper leaf just below the inflorescence, ovoid, bract-like, 2-3 cm long. *Flowers* on erect peduncle, 1-5, white with pink edging, about 2 cm across, rigid, in a short spike, hermaphroditic, not fragrant. *Perianth* star-like, tepals uniform, narrow lanceolate, sub-acute, 8-10 mm x 3-4 mm, opening widely and almost free from the base with incurved tips, white with pink edges. *Nectary* a distinctive pink 'pocket' in the middle of each tepal. *Filaments* 6; free from the base, 3-5mm long with

a broad base tapering to an acute apex; anthers ovoid, medifixed, tremulous, purple-red, about 2 mm long. *Ovary* tripartite, ovoid, red; styles three, half as long as the stamens. *Capsule* box-like, enlarging to 25 mm long, dehiscence apical-loculicidal. *Seeds* not seen.

Flowering

June to September, depending on rainfall (not an annual event).

Distribution and ecology

Known only from rock slopes in fertile red clays, on the eroding edges of a large barrow-like mound of red clay over archaic rocks, known as the Davenport Range.

Distinguishing features

Although superficially similar to other large arid-land species such as *W. deserticola* and *W. centralis*, the single pocket-like medifixed nectary on each tepal allows instant recognition. The pink tepal margins and purple stems also are good diagnostic features. *W. nilpinna* also flowers later than other *Wurmbea* of the north.

Variation. Very little variation shown except in flower size.

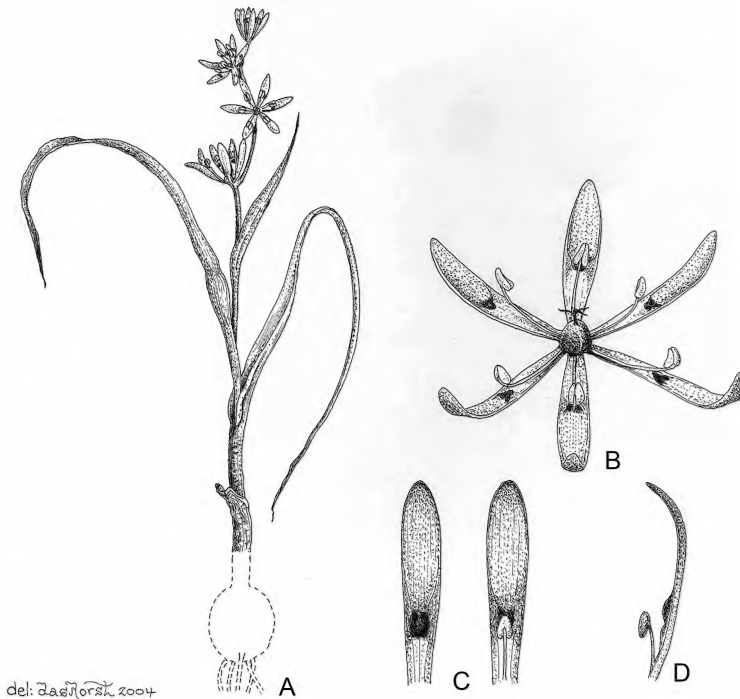


Fig. 1. *W. nilpinna* R.Bates. A, whole plant $\times 0.75$; B, open flower $\times 3.75$; C, tepals showing single pouched nectary $\times 6.75$; D, tepal in side view showing almost free stamen $\times 6.75$. (Based on Badman 7107).

History

The species was discovered at the type location by botanist and ornithologist Frank Badman while working on Nilpinna in 1993. It was eight years before suitable rains made it worth revisiting the area.

Sympatric species

Although *W. citrina* occurs on sandy flats 20 km west of the Davenport range no other wurmbeas are known from the range itself, although it is likely that *W. stellata* would appear after heavy autumn rains. It is not unlikely that further undescribed wurmbeas occur in the jumble of rocky ranges interspersed with gullies, sandhills, ephemeral creeklines and claypans in this area of very diverse geology occurring between Nilpinna and Lake Eyre.

Etymology. ‘Nilpinna’ is the name of Aboriginal origin, given to the large station property of which the Davenport Range is just one outstanding feature.

Conservation status

The Davenport Range is not conserved. The species has a total distribution within just 10 km × 1 km of this fast eroding relict feature and the area is grazed by cattle and wild donkeys, and (P. Jacobs, pers. comm. August 2001) has been grazed for a hundred years. The plants, however, are not under any immediate threat as they seem to be unpalatable to stock and appear only after rare rainfall events which ensure that there is always an abundance of other feed when *W. nilpinna* blooms. Not one plant showed any sign of browsing or insect damage during my investigations in the wet winter of 2001.

Other specimens examined

SOUTH AUSTRALIA. LAKE EYRE REGION: Davenport Range, 4km north west of Mt. Margaret on rocky edges of plateau, 15.viii.2001, R. Bates 59482, AD (live plants also sent to D.L. Jones, Australian National Botanic Gardens); 10km south east of Nilpinna Homestead, 14.viii.2001, R. Bates 59293, AD.

The *W. dioica* (R.Br.) F. Muell. complex in South Australia

Members of this complex are all dioecious, with well-spaced leaves and the nectary as a single band of colour across the centre of each tepal. Flower colour varies from bright citrine, to pink, white or cream. Habitat ranges from coastal waterholes, to woodland, rock outcrops, shores of inland salt lakes and even red desert sand dunes. The discovery that some of the many different forms occur sympatrically but do not intergrade suggests that they are distinct taxa, dependent on distinctions being retained throughout the range of distribution.

The types of *W. dioica* at the Natural History Museum, London (BM) are from Port Jackson (Sydney, New South Wales) and were collected by Robert Brown (Brown 1810). Plants seen by the author in the Sydney region had white flowers with pale nectaries and a long upper leaf. This is the common form throughout

higher rainfall coastal areas from southern Queensland, throughout south-eastern Australia and Tasmania as far west as Adelaide.

Bates (1995) described two new subspecies of this ubiquitous group, *W. dioica* ssp. *citrina* and *W. dioica* ssp. *lacunaria*, and discussed the possibility that other forms would later be described and named. Bates (2005) provided one of these the phrase-name. Following a revised key to the complex, this last taxon is described and named and *W. dioica* ssp. *citrina* is raised to species level.

Key to the *W. dioica* complex in South Australia

- 1: Flowers bright yellow-green; tepals fleshy *W. citrina*
Flowers not bright yellow-green; tepals not fleshy 2
- 2: Upper leaf short; female flowers often pink edged
. *W. dioica* ssp. *brevifolia*
Upper leaf with a long filiform apex; flowers not pink edged 3
- 3: Tall semi-aquatic plants, with most of upper leaf filiform
. *W. dioica* ssp. *lacunaria*
Short plants of non aquatic sites, with only upper half of leaf filiform *W. dioica* ssp. *dioica*

***Wurmbea dioica* ssp. *brevifolia* R.J.Bates, ssp. nov.**

A subspeciebus aliis folio superno brevior, floribus erubescens aetate protracta, plantisque sexualiter dimorphioribus i.e. plantae masculinae grandiores et nectaria coloratiores quam feminae differt. Fig. 2.

Typus. South Australia, Flinders Ranges: 24 km north of Hawker, 10.viii.1963, N.N. Domer 844 (holo: AD; iso AD: the collection includes both male and female plants).

W. dioica ssp. *Short upper leaf* (S. Williams CPB23): R.J. Bates in W.R. Barker et al. Census S. Austral. Vasc. Pl. (2005) 161.

W. dioica (R.Br.)F.Muell.: T.D.Macfarl., Fl. S. Austral. 1772 (1986), partly.

Description

Plants dioecious, to 20 cm tall, often dimorphic; the female plants usually smaller in all parts and turning pink with age. *Leaves* three, alternate, the lowest leaf linear-lanceolate, elongate, to 15 cm long and 5 mm wide, erect; middle leaf similar or shorter and with an inflated base; upper leaf just below the inflorescence, somewhat ovate and swollen to 1-2 cm long, as wide as long, its apex obtuse or acute, not elongated as in the other leaves. *Flowers* 1-6, male flowers about 2 cm across, white or cream, female flowers to 1 cm across, often turning pink with age; the tepals more rounded; nectary a single continuous horizontal band of purple about 2 mm across, set less than half way up each tepal; *stamens* on male plants only, adnate to tepals only at the base, white, to 6 mm long, the anther purple; *ovary* ovoid, often turning purple.

Flowering

Mostly in winter, from June to early September. Flowers long-lived, the female plants beginning to flower earlier and finishing before the males. The

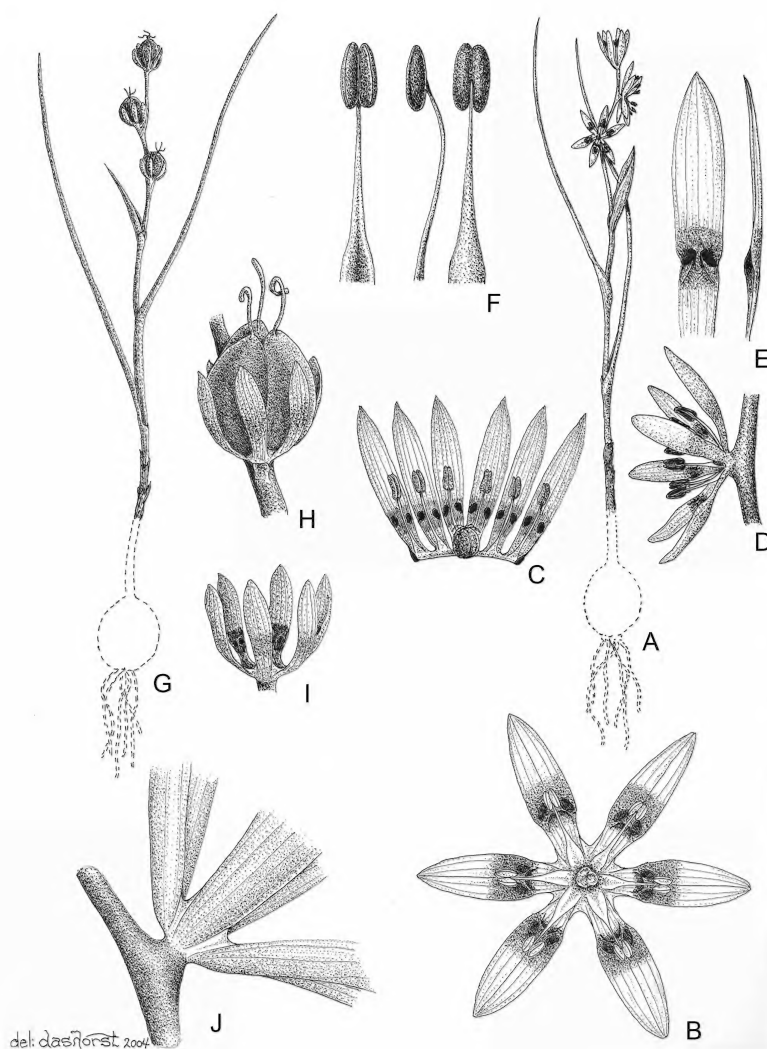


Fig. 2. *Wdioica* ssp. *brevifolia* R. Bates. A - F, male plant: A, whole plant $\times 0.9$; B, male flower in surface view $\times 7.5$; C, opened male flower $\times 6$; D, male flower in side view $\times 6$; E, tepal in surface and side view $\times 11.25$; F, stamens in front, back and side view $\times 18.8$; G - J, female plant: G, whole plant $\times 0.9$; H, flower after anthesis $\times 5.25$; I, flower showing cupped appearance $\times 5.25$; J, base of tepals $\times 7.5$. (Based on R. J. Bates 25641).

subspecies flowers earlier than *ssp. dioica* where the two grow together.

Distribution and habitat

This is the most widespread subspecies in South Australia, extending from the coast to well inland, especially common in the Flinders Ranges and on Eyre

Peninsula. The species occurs from the state's western border to its eastern border. It is found in drier sites than *ssp. dioica*, from coastal limestone and mallee, to mountain tops in the Flinders Ranges and rock outcrops in the southern pastoral zone. The species is likely to extend to the drier inland parts of New South Wales and Victoria.

Sympatric species

Often found with *W. latifolia* ssp. *vanessae* near the coast, sometimes with *W. dioica* ssp. *dioica* in drier hills. Further inland, in the Gawler Ranges, the subspecies is found with *W. australis* and rarely with *W. citrina* and *W. stellata*. In the Flinders Ranges it often occurs with or near *W. biglandulosa* and *W. australis*.

This taxon does not intergrade with any other taxa except for *W. dioica* ssp. *dioica* itself, mostly in the state's South-east.

Distinguishing features

Differs from all other subspecies of *W. dioica* in its short upper leaf, more sexually dimorphic plants, the female plants being smaller than males with less colorful nectaries; flowers turning pink with age, nectaries deep purple on male flowers.

In comparison with *Wurmbea* taxa overall, these attributes set *W. dioica* ssp. *brevifolia* apart from most other species and subspecies. The well separated, smooth-edged leaves separate it from *W. latifolia*, the short upper leaf additionally separates it from ssp. *dioica* and ssp. *lacunaria* of *W. dioica*, and the white or pink flowers set it apart from *W. citrina*. Through its cream flowers *W. dioica* ssp. *brevifolia* has in the past been confused with *W. citrina* but its reduced succulence, paler flowers, purple nectaries and different rocky, inland habitat separate the two taxa.

Variation

This is a variable taxon, not just because of its sexually dimorphic nature but because there are several loose geographic races which include a small slender purplish form from parts of the Gawler Ranges, a more robust cream flowered form from the Flinders and Barrier Ranges and the more common white-flowered form from the southern parts of the state. All are consistent however in their short upper leaf. DNA studies are required to sort these races.

Etymology

From Latin *brevis* short and *folia* a leaf, the name suggested by the comparatively short upper leaf of the subspecies.

Conservation status. Common and widespread.

Selected collections seen (from c.50 at AD).

SOUTH AUSTRALIA. NULLARBOR REGION: 78km E of the WA/SA border by the Eyre Highway, 8.viii.1989, *E.M. James 80*. FLINDERS RANGES REGION: Oraparinna Nat. Park, 14.ix.1971, *D.E. Symon 7342* (cream colored form). EASTERN REGION: Morialpa Station, 11.vii.1995, *R. Bates 41600* (with white flowers and purple nectaries). EYRE PENINSULA REGION: 15km west of Caroona (Koorinja) Hill, June 1991, *R. Bates 25516* (stems purple, filiform, upper two leaves close under the pink flowers); South of Port Neill on section 669 Hundred of Dixon, 19.viii.1965, *C.R. Alcock 669*. Yorke Peninsula region: inland from Daly Head, 27.viii.1976, *B. Copley 4971*. MURRAY REGION: 17km from Swan Reach, section 33, Hundred of Fisher, 12.viii.1995, *B.M. Overton s.n.* (contains good

examples showing marked sexual dimorphism). SOUTHERN LOFTY REGION: Port Elliott, on limestone, 28.viii.1967, *T. Smith 43*; Belvidere Scrubs, 6.viii.2000, *R. Bates 57180* (has the top leaf only one tenth the length of the middle leaf!) SOUTH-EASTERN REGION: Potters Scrub, Coorong, 8.vii.2003, *R. Bates 60972*.

W. citrina (R.J.Bates) R.J.Bates, *comb. & stat. nov.*

Basionym: *Wurmbea dioica* ssp. *citrina* R.J.Bates, *J. Adelaide Bot. Gard.* 16: 45 (1995). **Typus:** South Australia, Lake Eyre South, in low sand-hills, 9.vi.1978, *F.J. Badman 61* (holo.: AD).

W. dioica (R.Br.)F.Muell.: T.D.Macfarl., *Fl. S. Austral.* 1772 (1986), partly.

Description: see Bates (1995).

Notes

Further field studies since 1995 have shown that *W. citrina* is a very constant taxon, restricted to red sandy desert soils and with a discrete range. This range is mostly to the north of that of *W. dioica* but for a few locations where the two occur as adjacent populations. Where side by side, no introgression occurs. *W. dioica* does not grow on red desert sands. Differences in morphology further to those given in Bates (1995: as indicated in the above key) have been noted, not the least being the sexual dimorphism exhibited by *W. citrina*. Male plants have many more (up to 20), longer-lived flowers, in a loose flexuose spike. The author (Bates 1995) stated incorrectly that male plants of *W. citrina* had less flowers than female plants.

Distribution

W. citrina is considerably more common and widespread than previously thought, where the great majority of collections were known from the sandy desert regions of South Australia (Bates 1995). It extends to the west into the state's North-western region and across the Great Victoria Desert and to the east into the western border districts of New South Wales.

Variation

Most variation in size is due to seasonal conditions. As for other desert species flowering does not occur every year but only in years with heavy autumn or early winter rains.

Notes on other subspecies of *W. dioica* in South Australia*W. dioica* ssp. *dioica*

The known distribution of a reconstituted *W. dioica* ssp. *dioica* is now much reduced in South Australia. The distribution shown in Bates (1995) included a collection purportedly from the North-western region but this was based on incorrect collection details.

W. dioica ssp. *dioica* does not occur north of about Clare, in the state's Northern Lofy region, or west of Gulf St Vincent, preferring higher rainfall districts and avoiding calcareous soils.

***W. dioica* ssp. *lacunaria* R.J.Bates**

Only two collections have been made from South Australia, both from the edge of vernal waterholes, the most recent from Penola Conservation Park where it is said to be extremely rare (K. Alcock, pers. comm. November 2003).

Specimens examined

SOUTH AUSTRALIA. SOUTH-EASTERN REGION: Penola Conservation Park, *R.J. Bates 61517*, 11.xi.2003, AD.

***W. centralis* T.D.Macfarl. and
W. australis (R.J.Bates) R.J.Bates**

***W. australis* (R.J.Bates) R.J.Bates, comb. & stat. nov.**

Basionym: *W. centralis* ssp. *australis* R.J.Bates, J. Adelaide Bot. Gdn. 16: 39 (1995), non *Anguillaria australis* F. Muell., Fragm. Phyt. Austral. 10: 119 (1877).

Typus: South Australia, Siam station, Gawler Ranges (EP), on rocky hills of granite porphyry, 11.vii.1991, *R. Bates 25633* (holo.:AD).

Anguillaria dioica R.Br.: J.M.Black, Fl. S. Austral. 1: 187 (1943), partly.

W. centralis T.D.Macfarl., Fl. S. Austral. 1772 (1986), partly.

Description: see Bates (1995).

Notes

Continuing studies of populations of both *W. centralis* and *W. australis* throughout their range have shown that the two are very distinct in morphology and distribution, and are probably not closely related.

Their ranges are separated by over 500 km of desert. *W. centralis* a relict species known from only four sites in Central Australia, the largest two populations both at Katajuta. Bates (1995) recorded it also further south, based on Helms's collection from WaWee Waterhole, a location which is actually in South Australia, not Western Australia as previously indicated. The species is tall, with well separated, erect, channeled leaves and crowded flowers with rounded tepals.

By contrast *W. australis* is a common and widespread species throughout the southern pastoral zone of South Australia. It is generally short in stature with the lowest leaves paired, hardly channeled and not very erect, and the flowers well spaced with pointed tepals.

The nectaries of both species are similar but those of *W. australis* are larger, deeper and closer to the base of the tepal.

W. australis is probably more closely related to the small, single flowered, also South Australian endemic, *W. decumbens* which also has paired basal leaves (Macfarlane 1980).

The author gave some consideration to using a different specific epithet because of the existence of the illegitimate collective name '*Anguillaria australis*' F. Muell. (1877). However there is no likelihood of the genus *Anguillaria* being resurrected for Australian plants, as there seem to be no characters separating

South African species as a whole from the Australian ones as a whole.

Variation

There appear to be two races within *W. australis*, which warrant further study. A large form with broad fleshy leaves occupies granite outcrops such as in the Gawler Ranges, at Plumbago and in the northern Flinders Ranges, while a smaller form from the southern Flinders Ranges on quartzite.

Sympatric species

Over its wide range *W. australis* occurs with many other species, *W. biglandulosa* in the southern Flinders, *W. stellata* in the Gawler Ranges, *W. dioica* ssp. *brevifolia* through much of its 'non desert' range, *W. citrina* wherever exposed granite occurs adjacent to red sand hills, and *W. latifolia* ssp. *vanessae* near Melrose in the southern Flinders. There is no evidence of intergradation.

Notes on other South Australian species***W. biglandulosa* ssp. *flindersica* R.J.Bates**

Consideration was given to raising this taxon to species level but the discovery of intermediate forms between ssp. *biglandulosa* and ssp. *flindersica* has deemed this inappropriate. One example is a white flowered population in the grasslands of the midnorth of South Australia.

Specimen examined of intergrade

SOUTH AUSTRALIA. NORTHERN LOFTY REGION. North Bungaree, viii.1992, *R. Bates 28980*, AD.

***W. deserticola* T.D.Macfarl.**

The number of collections in South Australia has tripled since 1995, including a collection *Badman 1085* from the Great Victoria Desert over 200 km from the normal range of the species in the state's far North-West.

Macfarlane (1980) has already noted the two very different sand-hill and rocky slope habitats favoured by the species, with a common feature being the presence of *Triodia* hummocks.

W. deserticola in the ranges of Central Australia flowers freely only after fire. Observations were made on the margins of burned areas in the region. Plants in unburned sections were reduced to a single poor leaf while only a few metres away in areas burned six months earlier, plants were full size, most with up to a dozen flowers.

Specimen cited:

SOUTH AUSTRALIA. NORTH-WESTERN REGION. 8 km NE of Garford Outstation, Commonwealth Hill, in red sand, 14.vii.2000, *F.J. Badman 1085*, AD.

***W. stellata* R.J.Bates**

Searches for this species since 1995 have shown it to be common and widespread throughout rocky parts of the South Australian deserts, but appearing only in wet years.

***W. uniflora* (R. Br.) Benth.**

The author (1995) stated that this species, occurring in Victoria and Tasmania was 'Probably extinct in the Mt Lofty Ranges', having not been seen there for over a hundred years. However in 1996 the collection *Spooner 16208* was made near Mount Bold, south east of Adelaide by members of the South Australian Field Naturalists Society. Since then another population (*Bates 67321*) has been found in damp grassy messmate woodland a few kilometers away. Nevertheless the species is endangered in South Australia, being known from less than 200 plants.

Specimens cited

SOUTH AUSTRALIA. SOUTHERN LOFTY REGION: Thomas Creek Track, Mount Bold Reservoir, se side, 17.xi.1996, A.G. Spooner 16208, AD; Mt Bold Reservoir, 20.xi.2005, R.J. Bates 67321, AD.

Acknowledgements

I wish to thank the staff and associates at the State Herbarium, particularly to Gilbert Dashorst for the illustrations and Hellmut Toelken for the Latin diagnoses. Thanks also to Susan, Sonya and Sandy for companionship on field trips.

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